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ABSTRACT

This booklet introduces readers--particularly women--to some jobs that use mathematical training, in laboratories, computer centers, universities, insurance companies, and government offices. Based on information from women working in mathematics-related fields, it is designed to help women consider various career choices. Sections focus on careers with computers, engineering, finance, teaching, research mathematics, and statistics. Some types of careers within each category are described, with comments on the roles of particular women and quotations from women in that field highlighting aspects of their jobs. A list of names and addresses of women who answered the questionnaires is included, with the suggestion that they could be contacted, and organizations to contact for additional information on mathematics-related careers are also listed. (MNS)

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THE SKY'S THE LIMIT

in Math-Related Careers

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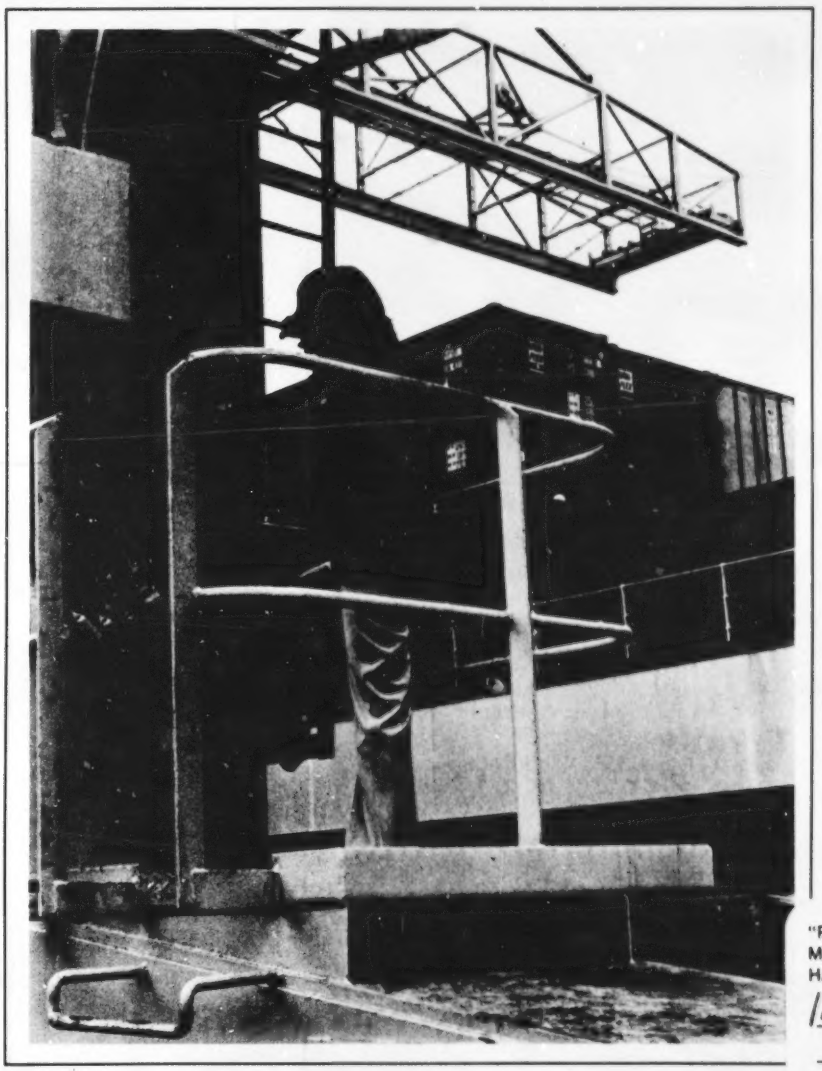

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Mills College
Oakland, California

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U.S. DEPARTMENT OF EDUCATION

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THE SKY'S THE LIMIT
in Math-Related Careers

Judy Askew

**Supported by a grant to Mills College
from the Women's Educational Equity Act Program**

Project Director: Joanne Koltnow

**Mills College
Oakland, California**

**Women's Educational Equity Act Program
U.S. DEPARTMENT OF EDUCATION**

T. H. Bell, Secretary

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Several hundred women took time to fill in questionnaires, sharing their thoughts about education and careers. Their responses form the basis for this book and their names appear in the resource list at the end. Without their contributions this work would not have been possible.

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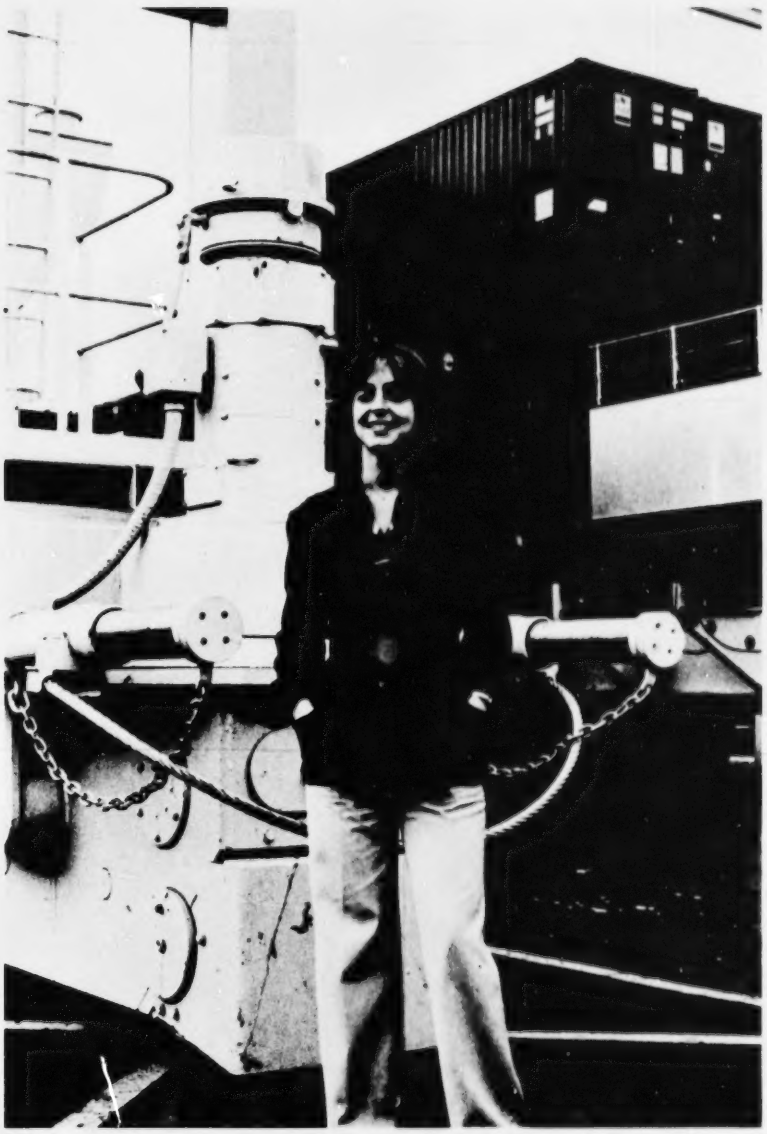
Peggy L. Evanich

Introduction

It's no secret that women can do all kinds of scientific and technical work. Unfortunately, most women have not received the necessary information, encouragement, and training they need to prepare for these math-related careers. According to the Department of Labor, in 1979 women were only 3 percent of all engineers, 16 percent of all engineering and scientific technicians, 23 percent of all computer specialists, and 33 percent of all accountants.

This book will introduce you to some jobs that use mathematical training—jobs in laboratories, computer centers, universities, insurance companies, and government offices. It's based on information from women working in math-related fields all over the country who answered questions about the challenges and rewards of their careers, the training required, and the ways they mix work with the rest of their lives.

Some of the women who are included in this book are working with equipment that didn't even exist when they were in school. Many others are working in careers they didn't know about when they started college. Reading about them will give you a head start on your own career choice, even if your future career isn't in this book or you aren't sure what you want to do. You will have some idea of the variety of careers that require mathematical training and the work involved in some of these careers.



Rita Liff Levinson

Computers

"... I once wanted to learn 'everything there is to know about computers.' But it's a challenge just to keep up with what I need to know to do my job—and that's only a small part of the subject."
(Michele A. Mingoia, Assistant Programming Officer, Mellon Bank, NA, Pittsburgh, PA)

Computers are becoming a part of our everyday lives. You may have seen computers being used in banks, supermarkets, and classrooms. Many of the women who contributed to this book use computers in their work in laboratories, schools, and businesses.

Computers are machines that store information and that can use this information to help people solve problems. In order to use computers, people have to decide on problems to be solved, determine what information is needed, and instruct the computers how to go about solving the problems.

The computer field is changing quickly, and computers are becoming smaller, faster, less expensive, and more reliable. Now computers control subway trains, allow blind people to read regular print, and even help design other computers.

Computer Programmers and Analysts

Computers need groups of instructions, called programs, that tell them exactly how to solve the problems we give them. Computer programmers write the instructions. Some programmers specialize in scientific work; others do business applications or educational programming.

Rita Liff Levinson writes programs for industrial control applications. For example, one of her programs is being used to help automate container ports in Los Angeles and Richmond, California.

"... Cranes load and unload ships carrying large containers. One main computer with cargo information for the entire port sends radio messages to small computers in each crane. My program tells the crane how and where to move the cargo.

"... Now that the program is nearly complete, I spend some time at the ports, which I particularly enjoy. Writing good programs is challenging and it's exciting to see my work being used in the development of the most modern container ports in the world."
(Rita Liff Levinson, Software Engineering Manager, TAK Components, Burlingame, CA)

Companies whose products use electricity want to be sure there will be enough power to keep them going. Linda Burton Trela consults for General Electric. GE works with companies that provide electricity throughout the world. The company determines future power requirements and finds out if existing power systems are adequate to prevent blackouts. Linda is now working part-time while raising children. She is called when there is additional work that cannot be handled by the staff. Then, she uses a terminal at home with a telephone connection to her company's computer.

"... I can work my own hours, which is a bonus when you can work at times the computer is not busy."
(Linda Burton Trela, Consultant, Schenectady, NY)

Gail Siletchnik taught herself FORTRAN, the computer language she uses at work. After several years in defense work, she changed to her current job with a company that specializes in writing computer programs for games: lotteries, jai alai, and track systems. Playing games (backgammon, Mastermind, etc.) is one of Gail's favorite hobbies, so she was attracted to the idea of using computers in games. Her work involves travel, which she enjoys.

"... Much of our work is done on site, and since we currently operate the lotteries of Rhode Island, Ontario, and Quebec, travel is a major part of my job. I prefer working on site, since I am a 'people person' and enjoy the contact with new people."
(Gail F. Siletchnik, Datatrol—Gaming Systems Division. Providence, RI)

Computer Center Staff and Maintenance

Vicki O'Day runs the computer center at Mills College. She makes sure the equipment is working properly and helps the students and faculty who use the center.

"... My job is to see that students and faculty get the most they can from the computer. This involves writing programs, installing programs bought from other colleges or companies, teaching students how to use the computer, and answering lots of questions.

"... If the computer stops working, I try to start it up again; part of my job is to guard against and recover from problems like this. It's challenging to work on several jobs at once and to cope with the unexpected."
(Vicki O'Day, Computer Center Staff, Mills College, Oakland, CA)

At Smith College, Lynn Goodhue holds a similar job. She is working full-time while her husband is taking care of their children and building their house.

"... I direct the day-to-day activities of the computer center. I make sure things are running smoothly for the faculty and students who use the computer and I supervise the students who do most of the programming."

Vicki O'Day

Lynn especially enjoys writing programs that help others use the computer easily and comfortably. She also handles problems with the computer hardware and other machinery.

"... I have to respond to immediate problems, for example, when a terminal goes on the blink or the whole computer crashes (stops operating). I handle some of the technical repairs myself or with the students, for instance, soldering cables or swapping logic boards in terminals."
(Lynn Goodhue, Director of Academic Computing, Smith College, Northampton, MA)

Computer Education

As new uses are found for computers, more people will need to learn about these machines. Computer science courses are taught at most colleges, and computers are even being used in elementary schools. Special workshops and textbooks are being developed for people who want to learn about this new technology.

Barbara Kurshan, Director of Academic Computing at Hollins College in Virginia, teaches courses in computer science and also works with the local school system on a plan to teach people about computers. Barbara used to be a programmer but enjoys her current work more now that she's combining computers with education.

In Berkeley, California, Flora Russ has been teaching computer programming to junior high students for the past ten years. When she started, the students used one terminal and shared a computer with two other schools. Now, they have several of their own computers to use in the classroom.

Flora loves teaching about computers, and the students enjoy what they're learning. For some students, Flora's class is especially useful; they learn so much that they can get programming jobs, even while they're still in school.

"... After 10 years, I feel that teaching computer programming is as exciting, varied, and challenging as it was in 1970."
(Flora Russ, Computer Teacher, King Jr. High, Berkeley, CA)

Flora Russ

Sales and Sales Support

Computer marketing and sales people match their customer's needs with the equipment that will best meet those needs. They consider the way the computer will be used as well as the customer's future growth and financial limitations. To do this work, salespeople need to understand what different computer models can do. Then, systems representatives decide what system is best for the customer and make sure it is installed and working properly.

Martha Griffin compares a customer's needs with her company's products, designs a system, and then recommends this system to the client.

"... Besides this work in presales, I have responsibility for installation when a sale is made. I also do customer support work, helping the customer use the new system effectively."
(Martha Griffin, Systems Representative, Prime Computer, New York, NY)

Students Adrienne Bahlke (left) and Kathleen Elliot

Computers and You

Every year, people make it possible for computers to do more work and to do it faster. This means, in turn, increased job opportunities. People are needed to design, manufacture, sell, maintain, and repair computers—both the machinery (hardware) and the programs (software). People are needed to figure out how to use the computer to solve problems in just about every field of human activity.

Adrienne Bahlke is a college student studying about computers. She chose this major because she enjoyed math in high school and wanted to apply it in a practical setting.

"... I realized that computer science was an up-and-coming field and decided to try it, even though I knew nothing about it. I enjoyed the logical thinking required and began to study computer science. Since then, my interest in various technical fields has increased.

"... Summer jobs have given me a good idea of what I can do. I worked at IBM one summer and got a feeling for the industry."
(Adrienne Bahlke, Computer Science Student, Stanford University, Stanford, CA)

Barbara Ann Koalkin

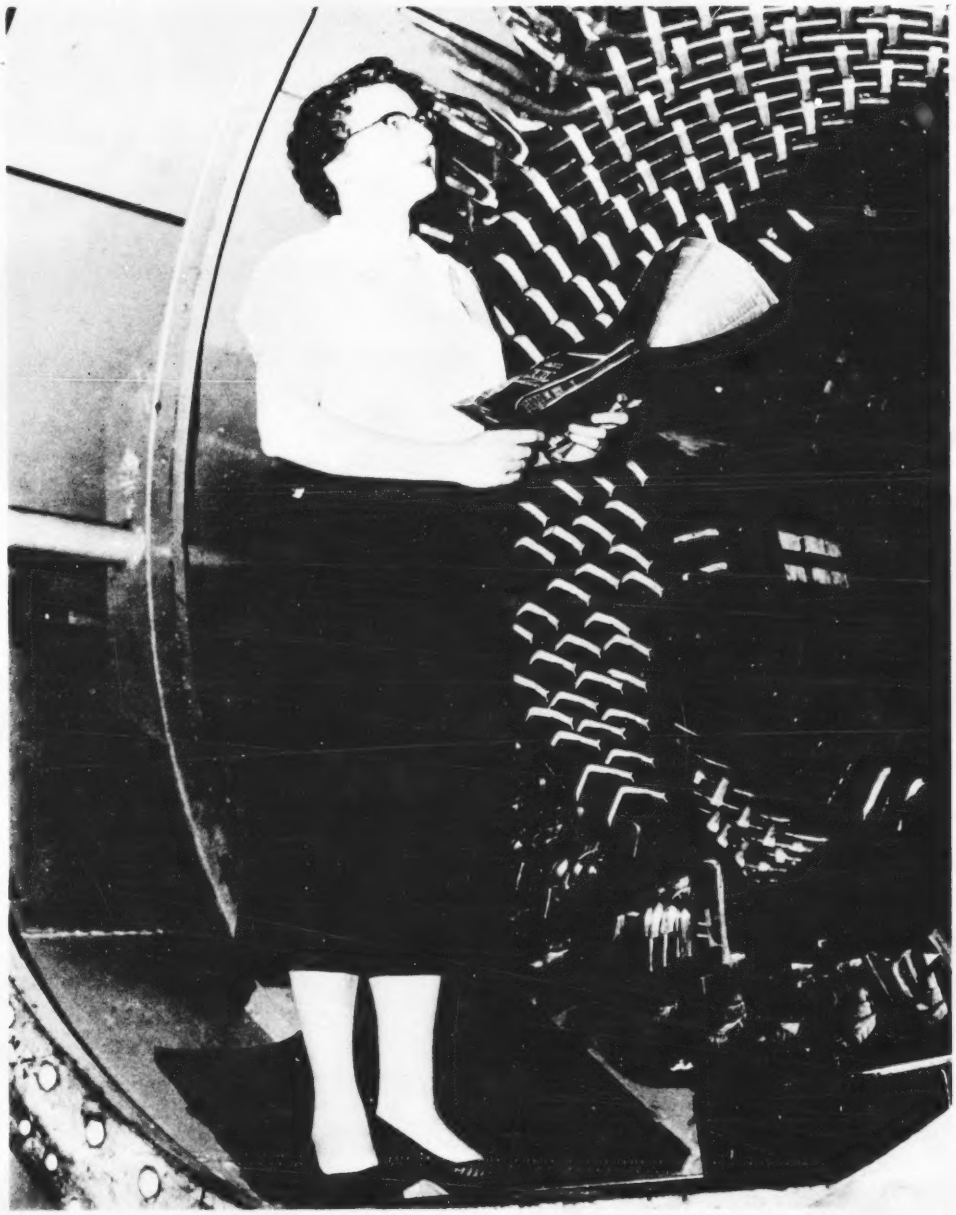
A summer internship at Xerox helped Barbara Koalkin decide to work there when she got her master's degree. Barbara is a computer engineer. In her first job at Xerox she was a programmer and helped design a computer language called Mesa. Four years and three jobs later, she is still at Xerox, but now in a program management position.

"... Part of my job involves long-range planning for the department; this includes product planning, scoping the development activities, and assessing the requirements (hardware and personnel). Many challenges are arising as I move into a management position – the challenges of managing people as well as the challenges that Xerox faces in coming up with better ways of managing information."
(Barbara Ann Koalkin, Technical Program Staff, Xerox Corporation, Palo Alto, CA)

If you are interested in working with computers, you can prepare by taking math courses and looking for special opportunities to learn about computers. There may be a computer store or computer center in your community that you can visit. You may be able to find summer programs or summer jobs in which you gain familiarity with computers. This will help you decide if you enjoy computer work.

The specific education you need for a career in computer science depends on the kind of work you will be doing. Some jobs do not require a college degree, while others require several years of advanced education. For many people work itself is a continuing educational experience. Rita Levinson explained that more education will open new opportunities for her:

"... There is plenty of room for advancement with my current training, but I want to learn more. I recently bought myself a Heathkit Electronics course. Now I'm learning about computer hardware on my own, at my own pace. This should enhance my options even more."



Emma Barth

Engineering

"... I like to see how things work. At first, I thought engineering was just numbers and machines. I thought that sounded dull. Now that I'm studying engineering, I see how many choices I have."
(Deborah Sweeley, Engineering Student, University of California, Berkeley, CA)

Engineering is the second largest profession in the United States. Only the teaching profession has more participants. You may know that engineers design bridges and power plants. Did you also know that they design artificial lungs, housing projects, safer factories, and tastier lettuce? The field of engineering is divided into more than one hundred different specialties. Engineering is as old as the Egyptian pyramids and as modern as lasers.

Engineers analyze people's needs and problems. They make use of scientific principles and discoveries to come up with new products, machines, or methods of working. Their solutions must be safe, practical, reliable, and economical. An engineer needs curiosity about the world around us, imagination to solve problems, and skills necessary to test solutions.

Only 3 percent of all engineers are women. But in 1979, 9 percent of the new engineering graduates were women. The number of women entering the profession is increasing.

Engineers Describe Their Work

Structural engineers are involved in the design and construction of buildings. Sue M. Frey, a structural engineer, has designed office buildings, a swimming pool complex, a theater, and several water and wastewater treatment plants. She works with architects as well as other engineers.

"... First, architects put together the idea of how they would like a building to look and function (how many rooms, size of corridors, entryways, etc.). Then I lay out a structural system—the roof, floor, and walls. It may be wood, steel, concrete, or a combination of materials. I also have to make sure the structure can withstand wind and earthquakes.

"... I work closely with the other engineers who are involved in the building process. During the construction of the building, I make several field inspections, so my job involves some travel."

Sue didn't start out planning to be an engineer.

"... I liked math and science in high school, so I started college as a chemistry major. I didn't even know engineering existed. Some vocational tests pointed to engineering and I found I really enjoyed the classes. Engineering puts both math and science to a practical use."
(Sue M. Frey, Structural Engineer, CH2M Hill, Corvallis, OR)

I. Jane Williams is a fluid technology engineer working for Sun Production Company. She is responsible for the accuracy of measurements made in the custody transfer (sale) of oil and gas for the company.

"... I analyze current methods and make recommendations for improvement. I also help solve problems which occur with the measuring equipment. The company has operations all over the United States, so I may be in Florida one week and California the next."

Jane had a lot of encouragement to go into engineering.

"... My parents encouraged a questioning attitude. Also, I was encouraged by a couple in my neighborhood as I was growing up. They both had engineering degrees. From the time I was two, they said I should get into engineering."
(I. Jane Williams, Fluid Technology Engineer, Sun Production Company, Richardson, TX)

Other engineers, like Emma Barth, decided later in life that they wanted to study engineering. Before she started this career, Emma was a high school teacher and then got a job making engineering drawings.

"... Since my interest in mathematics has always been strong, and since I had a younger brother who was an engineer, I decided to study engineering in night school. Semester after semester I gained more confidence. I finally decided that engineering was the right field for me and I went on to get a degree."

When she finally retired, Emma had worked for thirty-three years at Westinghouse Electric Corporation, in East Pittsburgh.

"... I was one of the mechanical design engineers who handled turbine generator orders. I calculated the stresses, vibrations, and so on, and wrote down specifications for the draftsmen to follow when they drew up the plans for the parts."
(Emma C. Barth, Professional Engineer, retired, Pittsburgh, PA)

Jennifer A. Buzun is an environmental engineer who is helping to eliminate water pollution by determining how much pollution factories and waste treatment plants can put into rivers without contaminating them. She collects data "in the field" and and then uses a computer simulation to help her predict pollution levels.

"... I spend some time in the field, getting the information that I need. I work in my office preparing the information and developing a model of how a particular industry or waste treatment plant operates. Then I work on the computer, making computer runs with the model. These runs predict the pollution level of the waterway."
(Jennifer A. Buzun, North Carolina Department of Natural Resources and Community Development, Raleigh, NC)

The Challenge of Engineering

Engineering offers exciting opportunities. Most engineers are fascinated by their work and enjoy learning new skills while solving problems. At times, deciding what the problem is may be harder than solving it. In some situations, engineers have to convert a problem in the real world into a kind of "book problem." Then, they can solve it using techniques they know.

"I enjoy discovering new talents that I didn't know I had through required jobs as well as optional assignments," reported Linda Clements, a materials engineer on contract to NASA/Ames Research Center. But solving problems is only part of an engineer's work. Many engineers become managers and find that personal communication is an important part of their jobs. Peggy Evanich works for NASA solving the problems caused by ice on aircraft. Peggy coordinates a project team.

"... Engineering is the easiest part of my work. Meeting test schedules and deadlines while coordinating the team is extremely challenging."
(Peggy L. Evanich, Aerospace Engineer, NASA, Cleveland, OH)

Anna Salguero is a telecommunications engineer and also a manager.

"... I manage a group of 20 people who maintain a computer system used by other groups. Working with different people with different personalities is a great challenge."
(Anna Salguero, Circuit Provisioning Specialist, Southwestern Bell Telephone Company, San Antonio, TX)

While she was in high school, Zella Jackson Underhill made plans for her future career.

"... I went to a technical high school where everyone planned ultimately to attend college. I recognized that an engineer, after only four years of school, could go out and command a good job and salary, whereas a doctor or dentist had eight or more years of schooling."

After she finished engineering school, Zella went to business school for a degree in management. Now she manages a department at IBM. Under her supervision, 15 people develop techniques to plan, measure, and control the inventory of complex electronic components. Zella works in an office with people, ideas, and paper.

"... The impact of my work hits our machines directly and dramatically."

Zella Jackson Underhill

Zella's company is very large and it can take a lot of energy before the course of events can be changed. Zella finds it important to motivate the people in her department to stay positive in the face of obstacles. Her job, though, can be very exciting.

"... Sometimes I have to orchestrate grand plans that require support from literally hundreds of other people... but once we succeed, ah—what glory!"
(Zella Jackson Underhill, Manager, IBM General Products Division, San Jose, CA)

Engineering Options

Engineers design the products and procedures of modern life. This chart gives some indication of the scope of engineering.

Specialty	Main Activity
aeronautical	design and develop aircraft
agricultural	solve problems in food growing, processing, and distribution; improve farm machinery
astronautical	design and develop spacecraft: satellites and orbiting laboratories
bio-medical	apply engineering principles to problems in the fields of health and medicine
ceramic	work with non-metallic materials
chemical	work with manufacturing processes in which materials undergo chemical changes
civil	design transportation systems and large structures; plan growth of cities and control of water quality
electrical	develop equipment which generates electrical energy, such as batteries or a power plant, or uses electricity, such as home appliances, or a computer
industrial	organize the parts of a manufacturing process: people, materials, and machines
mechanical	work with machines that produce power, such as engines and reactors, or that use power, such as automobiles and refrigerators
materials	convert processed materials into useful products

Does engineering sound like it would interest you? If so, now is the time to learn the basic skills you will build on in your later education and career. And gaining those skills now will make it easier for you if you decide to be an engineer. Math and science courses will give you the technical background you will need. Drafting and shop courses will help you get experience working with tools and materials. Social science and literature courses will help you understand more about the world. Engineers must understand the world around them in order to analyze and solve its problems. Linda Clements sums up the rewards of engineering.

"... Engineering lets me use my unique talents and interests. I'm doing high-quality research and thus gaining the respect of my colleagues as well as tremendous self-satisfaction."
(Linda Clements, Materials Engineer, NASA/Ames Research Center, Moffett Field, CA)

Finance

"... I use the training I have had in the mathematical discipline to come up with creative solutions to many varied situations. Then I communicate those solutions to people who may not have any mathematical training."
(Bonnie C. Luneburg, Associate Actuary, Industrial Indemnity Company, San Francisco, CA)

Money is whatever people use to pay for things. The actual metal or paper doesn't have much value itself, but people agree on the value because using money is easier than trading for everything we want.

Mathematical skills are needed to manage money. You probably know people who work directly with money—in stores, banks, and restaurants. There are also people who manage large amounts of money in insurance firms, investment companies, and banks, as well as in the financial departments of businesses and schools.

Actuaries

Why is car insurance more expensive for younger drivers? How much should it cost to insure a house against tornado damage? Actuaries calculate the rates for different kinds of insurance. They analyze how often an illness, accident, or disaster occurs, and find out what the resulting expenses are. Based on this information, they set the rates to insure people against that specific risk. The price may vary for different people. Smokers may pay more for health insurance, and people near a river may pay more for flood insurance. The price of insurance must be high enough to provide funds for people who do suffer losses, but it must not be so high that people will choose not to purchase it.

Jeanette Powelson analyzes insurance premiums and makes projections based on past experiences.

"... I estimate the costs and effects of changes in procedures and the impact of different regulations. I write computer programs to produce statistical forecasts."
(Jeanette Powelson, Assistant Actuarial Analyst, Fireman's Fund Insurance Co., San Francisco, CA)

Anne Kelly works for the state of New York, overseeing the rates set by insurance companies.

"... The state must approve the rates that companies set for automobile and workers' compensation coverage. I review the proposals from the insurance companies and give my recommendations to the superintendent of insurance for the state. Much of my work is assessing the judgment of other actuaries concerning future events. Will the number of auto accidents increase or decrease? How much will an average claim cost?

"... There are difficult theoretical questions involved. How do you measure the profit of an insurance company? Should rates be based on classifications like age, sex, and marital status?"

Anne sees positive results from her work.

"... Working for the government, we do get to make some worthwhile changes in insurance policies. The challenge is that these questions do not have strictly technical answers—they involve social issues, and compromises must be made."
(Anne Kelly, Assistant Chief Casualty Actuary, New York State Insurance Department, New York, NY)

Bankers

Just like other businesses, banks are run to make money. Banks pay people to lend them money so they will have it to lend to other people. As a way of encouraging people to use one bank rather than another, banks also provide other services. They sell travelers' checks, provide safe deposit boxes, and handle trust accounts for people who cannot manage their own finances. All this requires coordination and planning.

As a bank president, Sally Buck is responsible for making sure that all of the bank's activities are being done correctly. She has been in banking for 37 years and has experience in many different banking operations.

"... My math-related activities include handling all bank investments, preparing an annual budget, and projecting sources and uses of funds.

I also work with people—the customers, the employees, and the Board of Directors. It's vitally important to be creative and plan for the future."
(Sally S. Buck, President, The Women's Bank, Richmond, VA)

Mavis Taintor specializes in loans. If a company wants to borrow money from the bank, she assesses its ability to repay the loan.

"... I manage Citibank's money lending to approximately fifteen of the nation's biggest brokers. I analyze the companies' performance and financial status to determine if the bank wants to lend money to them."
(Mavis Taintor, Senior Account Officer, Citibank, New York, NY)

Investment Counselors

Suppose you have an idea for a new gardening tool but not enough money to make the first ones to sell. You might look for someone who will lend you the money to start your business. That person is investing in your business.

Some investors may want an investment that is going to increase in value slowly but steadily. Others may want to take a chance on a company that might make a large profit but might also fail. Investment counselors investigate the potential growth of different companies and advise clients on which ones are best for their needs.

Lucy Williams studied languages in college. She didn't know what investment counseling was until her first job in that field. Now she works for the largest counseling firm in the country.

"... I manage several trust accounts and individual accounts. My firm also manages all types of institutional accounts (for example, a corporate pension fund). I am responsible for selecting stocks and bonds for the accounts which I manage, based on my clients' investment objectives."
(Lucy W. Williams, Assistant Vice President for Investments, Scudder, Stevens & Clark, New York, NY)

As an investment specialist and a stockbroker, Pat Plant gives advice to people who want to make their money work for them. She became interested in finance when she researched the market in order to invest her own money.

"... I became an investor before I became a broker. I had a sum of money that wasn't working for me, so I decided to invest and tried the stock market."

Pat's work days are long but she gets immense satisfaction from her work.

"... It's like connecting with a tennis ball and knowing that you hit it perfectly. I strive for that every day, in everything I do. I may be the only one who knows when I am really good, but I get a great deal of satisfaction from doing things well."
(Pat Plant, Investment Specialist, Sutro and Co., San Francisco, CA)

Pat Plant

Accountants and Auditors

Imagine a music store in which the owners sell records and put the money in a box. Every week, they take money from the box to pay the bills and to buy more records. Running their store this way, the owners won't know which records they have and which are sold out. They won't know if they will have enough money to pay the bills, or whether they should borrow or have a sale. An accountant could help them.

Accountants do financial record keeping and develop systems for handling money. In the case of the record store, an accountant would set up a system to control the inventory and keep track of income and expenses.

Some accountants work in the financial departments of companies; others work for accounting firms that manage the accounting systems of many different companies. A large accounting firm employs accountants in many different jobs. Janet Arnold specializes in tax questions.

"... I work with a number of clients, over the phone and at their offices. I prepare tax returns, research their tax questions, and plan for their tax savings. In the spring, I concentrate on individuals' tax returns and at the end of the year my main work is tax planning for the next year."
(Janet Arnold, Senior Tax Accountant, Price Waterhouse & Co., San Francisco, CA)

Betty S. Cash is a senior accountant. She became interested in accounting after an internship with her company.

"... I took a semester off from school during my junior year in college and worked here as a trainee. I was able to see what would be involved in a career in public accounting and I liked what I saw."

Betty and her staff go out to various businesses and audit the accounting records. Then, they prepare a statement about the financial condition and record keeping of the company.

"... We normally stay at a client's office for about three weeks, but depending on the size of the company, we could be there from one week to six months."
(Betty S. Cash, Senior Accountant, Price Waterhouse & Co., San Francisco, CA)

Financial Directors and Budget Analysts

Within large companies, financial directors and budget analysts oversee the income and expenses of the company. Sharon Gerpheide entered the financial field after having children. She had a year of on-the-job experience in an internship program while she was in college. Now at NASA/Ames Research Center, Sharon spends most of her time managing the money from NASA headquarters that funds different research projects. Sharon enjoys the challenge of designing new systems to handle the huge amounts of data she uses.

"... I design and use computer reports to keep track of funding on a weekly basis. I assist management with the preparation of weekly budgets and make sure that funding is used properly."
(Sharon Gerpheide, Budget Analyst, NASA / Ames Research Center, Moffett Field, CA)

College and university administrators hire financial directors to help them manage their institution's money. As the Director of Finance at Mills College, Judy Arrigo directs a staff of ten people who collect and distribute the college's funds. Judy has done accounting and bookkeeping since high school. Her work at Mills includes preparing financial reports and projections, solving problems with student accounts, preparing financial reports, monitoring cash flow, and working to increase the money which has been given to support the College.

"... Working with numbers and basic accounting principles can be a challenge in any business; in a college or university it is critical to the health and well-being of the institution."
(Judith A. Arrigo, Director of Finance, Mills College, Oakland, CA)

A Future in Finance

As businesses and governments become larger and more complex there is more need for financial specialists. These people may work for one company or provide consultations to different firms. If you are interested in numbers, money, and people, you may want to consider career possibilities in the world of finance.

For the next few years, your best preparation is to take mathematics and accounting courses. Summer jobs can introduce you to the way businesses operate. Later, more specialized education is required. Many people in this field have a master's degree in business administration. Some have passed special accounting or actuarial examinations. And many women we heard from echoed Mary Elbaum:

"... Although a higher formal education is not necessary, continued education and training are required and essential to keep up with changes in the field."
(Mary Elbaum, Accountant, Chevron, USA, Walnut Creek, CA)

Judith A. Arrigo

Diane Resek

Ruth Willis (left) and Elizabeth Stage

Math Education

"... I am teaching people first and math second. No two students see things the same way. I feel I am helping people turn themselves into creative, productive individuals—and this is a contribution to changing the world."
(Nancy Haggerty, Instructional Assistant, Los Medanos College, Pittsburg, CA)

If you enjoy mathematics and get satisfaction from figuring out the best way to help someone else understand it, then education may be the career for you. Math educators at all levels enjoy the challenge of structuring material so students will be able to understand it. They also try to figure out how to make interesting problems out of sometimes dull material.

Classroom teaching is probably the most familiar of these careers, but people in math education also develop methods for teaching and testing and do research to understand how people learn math.

Classroom Teaching

Paula Emerson Fay was interested in mathematics before she thought about teaching. Then, six weeks of practice teaching while she was in college helped her realize that teaching was the right job for her. Teaching gives Paula a way to share her love of mathematics with others. The junior high students in her classes have different math abilities, so Paula uses one teaching method or another, depending on what the students need.

"... It is my job to provide these students with the mathematics they will need for the future, and this is different for different students. In some classes I spend a great deal of time emphasizing the practical applications of mathematics to daily living. In other classes, I go into more theoretical aspects of mathematics."
(Paula Emerson Fay, Math Teacher, Dedham Junior High, Dedham, MA)

On the other side of the country, Ruth Willis also teaches in a junior high. In addition to wanting her students to learn basic skills, Ruth views teaching mathematics as a vehicle for allowing students to achieve a sense of personal power.

"... Once we visualize ourselves as capable I think most of us can achieve anything we want. Since the successful study of mathematics is a high-status activity in the world today, I spend my energies helping students know they can be successful with math. Then they seem to think they can be successful in anything."
(Ruth Willis, Math Teacher, Hamilton Junior High, Oakland, CA)

A high school teacher may teach a variety of courses. At Kailua High School in Hawaii, June Yamashita teaches a wide range of courses and also tries to be available when her students need her.

"... I've taught everything from arithmetic with whole numbers up to pre-calculus. Besides keeping up with the field, teaching means being available to students in times of difficulty or personal crisis."

Right now, June is back in school herself. She's studying for an advanced degree and expanding her own knowledge of math and other areas of education. Unexpectedly, she's also finding out what it's like to be on the student side of the classroom.

"... I'm re-learning, through personal experience, what it means to be a student again. This will help me better counsel high school students."
(June J.M. Yamashita, Kailua High School, Kailua, HI)

When they're especially interested in a project, teachers may take on extra work outside the classroom. Dorothy Dow and two other teachers spend one lunch period every week working with the school math club and running math contests. They also spend another lunch period in an organized "help session" for students. Like many teachers, Dorothy and her friends want their students to be successful in their math courses and to stay in math so they'll be prepared for a wide variety of careers.

"... Probably my best advice to students is to ASK FOR HELP from your teachers as soon as you need it. That's part of what teachers are designed for. Too often, students wait until their problems are overwhelming and then they give up on math."
(Diane Resek, Associate Professor, Mathematics Department, San Francisco State University, San Francisco, CA)

College Teachers

Some college teachers combine classroom work with research or administrative responsibilities. Other college teachers design new programs in their departments or new ways to make learning easier for the students.

Sometimes college teachers discover that their students need a course that isn't being taught. While teaching math at San Francisco State University, Diane Resek realized that there were many students who needed or wanted to take math, but were afraid of it. Diane's experiences teaching younger students and making films about math helped her decide on the methods to use with these college students. She designed a "Math Without Fear" course which has a laboratory where students do puzzles and play games to build their abilities and confidence about doing math.

"... When the students play games they relax. They use problem-solving processes in a non-math environment. Before they know it, they're not only doing math, they're actually enjoying it!"
(Diane Resek, Associate Professor, Math Department, San Francisco State University, San Francisco, CA)

Jane Gentleman "fell in love with math" in her 7th grade geometry class, and with computers on her first job. Now that she's teaching at the University of Waterloo in Canada, she's combining computers with education. Recently, Jane set up a classroom equipped with a computer terminal and 25 TV monitors. This allows the professor to work on one computer terminal while all the students watch on their own TV screens.

The room Jane set up is used to teach statistics, but it could also be used for other kinds of teaching with computers. With this equipment, the students can see demonstrations during the class instead of having to go to a computer laboratory at another time.

Your math teachers in school studied math in college, but many of them also took math education courses to learn the best ways to teach math. Math education is especially important for future elementary school teachers, because these people are going to teach math to children. At Hampton Institute in Virginia, Genevieve Knight

teaches math education courses for future teachers as well as math courses for science majors. She has specialized in preparing teachers who will teach children with learning disabilities.

Education Outside the Classroom

At the Educational Testing Service, people develop admission tests for college, law school, business school, and medical school. They also develop tests that use materials other than paper and pencil, and tests that teach new skills while they test. Because these tests affect people's opportunities, there's a challenge and responsibility to make sure they test understanding rather than how to take tests.

How do you test for understanding rather than memorization? What's a fair test? Is this a question students in different parts of the country will understand? Edith Robinson was a teacher for many years. Now she works at the Educational Testing Service developing test items. Sometimes, Edith has to come up with new ways to do things in a short time. This is another kind of problem solving, which she enjoys, and it makes her work even more interesting. Although she's no longer in the classroom, Edith's work relies on her earlier experience.

"... The work I do currently draws not only on my own training but also on my former teaching experience."

Edith also develops suggestions for parents who want to help their children in school, and for teachers who want to help children who have learning difficulties. Like most people who enjoy their work, Edith wishes she had more time for it. She'd especially like to know more about the learning process.

"... I wish I had more time to follow through on the data we collect and to do research to learn more about how people learn mathematics."
(G. Edith Robinson, Educational Testing Service, Princeton, NJ)

Like Edith Robinson, Elizabeth Stage also taught math, enjoys solving problems, and is interested in measuring understanding. Elizabeth works at an educational research and development center which is a place where people study how people learn and try to find better ways to teach.

Elizabeth tries to find activities where students can show what they know.

"... What I'm doing now is trying to bridge the gap between what people can do and what they produce."

Elizabeth's research has shown that there are differences between how girls and boys perform on tests, but that there are no differences in their mathematical ability.

"... Some people think that the under-representation of women in math-related fields is due to ability differences. They say that girls aren't supposed to do well in math or that math doesn't matter for women. I think that when we see differences in performance in math they are due to social factors that can be changed, both in individual's confidence and society's expectations."
(Elizabeth K. Stage, SESAME, University of California, Berkeley, CA)

Other math educators also work on projects outside classrooms. Some of them, for example, study the effects of calculator use on students' work. In Western Springs, Illinois, Kay Nebel is conducting a study to find out how using calculators affects the achievement of 5th and 6th graders. In San Francisco, Carol Langbort is trying to find out whether using calculators helps students solve word problems with large numbers. Some math educators examine whole programs. At the Florida Department of Education, Renee Henry evaluates math programs and materials and recommends ways to improve them. Sometimes Renee works in her office, but when she gives workshops for teachers she usually has to travel.

Margo Nanny has two big projects. She's working on a new math program for blind students and she's also teaching a class for adults who are afraid of math. Margo is especially excited about teaching math to adults. When she was in college, she loved math, but she had a difficult time in the classroom. This was a very confusing experience for her.

"... Math professors frequently told me that my test scores in their classes proved I'd never be much of a mathematician, but I loved to relax at home and do math. Finally a professor suggested that I take classes with take-home tests and suddenly I excelled."

When she finished college, Margo decided to teach rather than go to graduate school to prepare for doing research.

"... I decided I'd rather change the teaching of math to spare other people the kinds of experiences I had."

A Career in Education

Without math teachers, none of the careers described in this book would be possible. A background in math is useful for everyone, and teachers get tremendous satisfaction when they share their appreciation and love of mathematics with their students.

You may already enjoy explaining things to other students or younger children, so perhaps you are already considering becoming a math teacher. If you think you would enjoy their work, talk to some of your own math teachers. Also, keep in mind that there are career possibilities in college teaching and outside the classroom, such as developing materials, tests, and books (like this one).

The education math teachers need depends on the level they teach. Elementary and high school teachers require a state credential based on a year or two of education courses during or after college. Most university professors need Ph.D's. Many jobs are available at colleges for people with a master's degree.

Mathematics is a subject that requires good teachers and the determination to keep trying, even if you have a discouraging experience. Many math teachers would agree with Margo Nanny on the importance of helping students realize that what they learn is up to them.

"... When students have discouraging experiences, I urge them not to blame themselves, and not to give up. I try to convince students (young and old) that they can take control over their education and that their choices are meaningful."
(Margo Nanny, Berkeley Adult School, Berkeley, CA)

Research Mathematics

"... I consider myself comparable to an artist when I'm doing my research—taking ideas and mathematical constructs and putting them together to form a beautiful mental picture."
(Barbara L. Osofsky, Professor of Mathematics, Rutgers University, New Brunswick, NJ)

People who do research in mathematics often divide the field into two general categories of work. Applied mathematicians formulate and solve problems resulting directly from actual situations. Pure mathematicians solve problems that are more abstract. They focus on expanding people's understanding of mathematical relationships. However, much pure math turns out to be useful in describing the world and, therefore, has practical application.

Doing Mathematical Research

One place where mathematicians do research on practical problems is the National Bureau of Standards in Washington, D.C. The bureau maintains the basic units of measurement—mass, length, temperature, frequency, and electrical units. These basic units are important for measuring things we want to regulate—like air pollution and pesticide levels and the scales in stores that weigh our food.

At the National Bureau of Standards, Joan Rosenblatt's group does research to improve the statistical methods used in physical and engineering sciences. For example, they assist experimenters with measuring sound and noise.

"... There is an active program on the physics and psychophysics of sound and noise measurement—how to characterize the noisiness of cars and trucks, lawn mowers and home appliances, not to mention construction machinery and rock bands, so that standards and regulations can be written to protect hearing."
(Joan R. Rosenblatt, Deputy Director, Center for Applied Mathematics, National Bureau of Standards, Washington, DC)

When mathematicians do research, whether pure or applied, they think about the problem, try out ideas with pencil and paper, and read what other people have written. Barbara Osofsky says that her research in ring theory involves keeping up with what other people have done and attempting to prove new theorems in the subject. Meetings with other mathematicians help her get ideas for ways to tackle her problem. Barbara doesn't need special equipment for her research.

"... The major tools, besides the library, are pencil and paper or a blackboard to experiment with ideas, try different attacks on problems, and record results."

Creating Mathematical Models

A model is a representation of something. You're all familiar with model planes, model cars, and dolls. Mathematicians try to find mathematical ways to represent or describe events and they call these descriptions models.

In her work at the Naval Postgraduate School, Patricia Jacobs makes probability models. This means she uses mathematics to represent phenomena whose outcomes can't be determined in advance.

"... A mathematical model is used to provide insight into how a system works or to suggest how it might be improved. Building a model from scratch involves deciding what you want it to tell you and what features of the system are important."

The next steps in her work are more familiar.

"... Once a mathematical model and the questions to be answered are formulated, then the problem is a mathematical one, somewhat like a homework problem. Sometimes well-known mathematical techniques can be used to solve it; other times, new techniques need to be invented."
(Patricia Jacobs, Operations Research Department, Naval Postgraduate School, Monterey, CA)

Using Research Results

As Director of Institutional Research for a large community college, Elaine Tatham works on projects with a staff of people. In one project, she studied the pattern of births, deaths, and migrations in her community in order to predict future population changes. This information has been used by a hospital planning to expand, a fire department deciding where to build a new station, and churches developing membership programs.

Another time, her group surveyed companies that hire artists in order to help the college decide whether to develop a program to teach commercial art. Elaine thinks her work is very exciting and would like more people with mathematical skills to consider doing this kind of research.

"... The trick is to identify and complete research projects before they are needed, so that the information is available when the need arises."
(Elaine L. Tatham, Director of Institutional Research, Johnson County Community College, Overland Park, KS)

Elaine L. Tatham

Combining Research and Teaching

Many mathematicians, including some mentioned earlier, combine research with college teaching. They find this mixture is good for both parts of their work. Mary Ellen Rudin does her research and teaching at the University of Wisconsin.

"... My primary concern is with mathematical ideas and research—mostly done on the living room sofa. I also teach and have other university responsibilities, but the research and teaching is combined rather than strictly separated."
(Mary Ellen Rudin, Professor of Mathematics, University of Wisconsin, Madison, WI)

Before she decided on math, Jane Day was a chemistry major. She found she liked mathematics, so she switched. Then, in graduate school, she "became captivated by topology!" As the chairperson of the math department at a small college, Jane teaches, plans courses, writes reports, participates in professional organizations, and saves summers for research. She finds both research and teaching are exciting challenges.

"... Getting to know students individually and trying to turn them on to mathematics is hard but very rewarding. Two of my own college professors were very encouraging and I want very much to be as inspiring and effective."
(Jane M. Day, Professor of Mathematics, College of Notre Dame, Belmont, CA)

Sometimes two people can share a job. At Smith College, Joan Hutchinson and her husband share one full-time position in the math department. This means they each teach three courses a year and spend about the same time on their research. Joan's research involves abstract questions about graph theory.

"... I worked for a year as a computer programmer and decided I preferred teaching and abstract math. Now, I use the computer both in my research and my teaching."
(Joan P. Hutchinson, Assistant Professor of Mathematics, Smith College, Northampton, MA)

Judy Roitman switched from writing poetry to teaching mathematics. Once she got into math, two women researchers encouraged her to keep going. Judy enjoys her teaching.

"...I come into my office about 8:15 a.m. and plan my teaching or work on a research project. Students and other faculty members often come in to discuss projects. I work closely with some graduate students and spend quite a bit of time talking to them. After I teach and have lunch, I usually go home and work in my office there."

Research, however, provides "extraordinary rewards."

"... Sometimes I really get into my research and then it is a day and night and weekend and wake-up-in-the-middle-of-the-night sort of thing. The mix of creativity and precision in mathematics is matched in very few other disciplines."
(Judy Roitman, Associate Professor of Mathematics, University of Kansas, Lawrence, KS)

New Horizons in Research

Sometimes it takes years for the results of mathematical research to be used to solve practical problems. Therefore, many mathematicians work on questions they find fascinating in themselves. This fascination with mathematics may begin when the person is quite young. For example, when Lenore Blum was in high school, she was attracted to mathematics because it seemed so perfect.

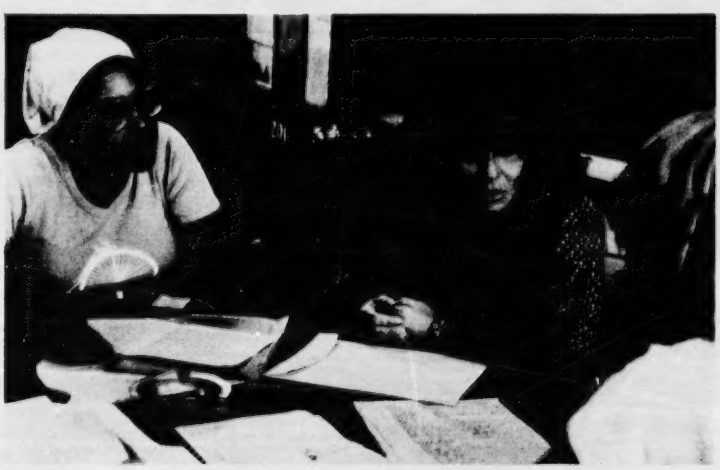
"... I believed that if only I worked hard enough, or studied enough, or was clever enough, I could eventually solve any problem presented to me. What a surprise to learn in college that there are problems that cannot be solved."

This idea of unsolvable problems so intrigued her that her later research was directed at trying to understand why some problems could be solved and others could not. Now, a more recent challenge for research comes from computer science.

"... For computers to solve problems, it is not enough that a problem can be solved in theory. It would certainly not do to have a method that would take our most powerful computers centuries to produce an answer. A challenge for the 80's will be to better understand the nature of what we call 'computational complexity,' namely, ... to find fast methods when they exist... to determine when fast methods don't exist... to harness 'hard' problems to our advantage, such as is being done in designing unbreakable codes."
(Lenore Blum, Head, Department of Math and Computer Science, Mills College, Oakland, CA)

There is always more to be discovered about the nature of mathematics and its application to practical problems. If you enjoy the mathematics you're studying now and want to continue, you may wonder who will hire you just to find out new things. Both pure and applied mathematicians can find jobs in universities, government agencies, and private industry. However, funding for a particular research project may depend on writing a proposal to convince someone who has money that the proposed work will be useful.

Is research the job for you? It may be—if you enjoy finding problems that are new and exciting and finding new ways to approach solving them.



Lenore Blum

Statistics

"... It's exciting to see the progress being made in conquering cancer with the use of mathematics and statistics."
(Nancy L. Geller, Associate, Sloan Kettering Cancer Center, New York, NY)

We're all familiar with opinion polls that predict how elections will turn out or tell us what the "country" thinks about an important issue. Usually, about 1,500 people in different parts of the country are chosen to answer the pollster's questions. How can we know that what these 1,500 people answer is really the way the country thinks?

Statisticians are concerned with these kinds of questions. They deal with complicated problems in science, industry, and government that involve sorting out large amounts of information or collecting information that describes large numbers of people. They apply special techniques for choosing small numbers of people who, as a group, are very much like the larger population they are chosen to represent. Statisticians also apply mathematical methods that tell them how accurate predictions are or how representative the opinions they've collected are.

Statistics is a branch of applied mathematics that is used in many types of research and in many business and governmental operations. People trained in statistics may find themselves working in a wide variety of fields, applying their skills to many different kinds of problems.

Statisticians Describe their Work

Nancy Conlon discovered she liked math when she was in 8th grade. She liked it so much that she studied it in college. Her first job in Washington was with the Census Bureau, "which is as statistically oriented as a place can be. I've been in statistics ever since." Now, Nancy works at the National Science Foundation where she coordinates a study in which 50,000 scientists and engineers are surveyed every two years.

"... I help plan the survey, design the questionnaire, oversee the tabulation of data, and write the final report. We investigate education, employment, geographic location, and other factors."

Nancy worked part-time for many years while her daughter was growing up. She thinks that mathematical skills are still rare enough that a woman in this field has many choices and can arrange part-time work.

"... I was able to keep a 'foot in the door' while working part-time."
(Nancy Marie Byrne Conlon, Statistician/Program Analyst, National Science Foundation, Washington, DC)

Barbara Bailar became interested in statistics in college. At the Bureau of the Census, in Washington, DC, she works on large surveys.

"... I am responsible for statistical standards and methodology. I review the sampling plans and survey methodology for large surveys in employment, health, or crime victimization to make sure the survey data will as nearly as possible reflect the population."
(Barbara A. Bailar, Associate Director for Statistical Standards and Methodology, Bureau of the Census, Washington, DC)

New cosmetics and drugs have to be tested before they can be sold to the public, and statisticians help design and conduct these tests. Cecilia M. Kuzma works at Proctor and Gamble Company in Cincinnati, Ohio. Her job involves testing the cosmetics and drugs that people can buy without a prescription. She is the head of a research station that designs, carries out, analyzes, and interprets studies of people using these products.

Except for 11 years when her children were young, Dorothy Rice has worked in the Federal Civil Service since 1941. In her current work she is in charge of the agency that conducts surveys of illness and disability in the United States.

"... We find out the amount of illness, its effects, and the medical care people receive. We collect the official 'vital statistics' of the United States. We try to anticipate the information that will be needed in the future and to start gathering that data ahead of time."
(Dorothy P. Rice, Director, National Center for Health Statistics, Hyattsville, MD)

Many statisticians look for solutions to health problems. Ardyce Asire, for instance, is a statistician at the National Cancer Institute in Bethesda. Her section collects information about cancer patients to determine how many people get this disease and how many survive. Nancy Mann is a project manager at Rockwell International in Thousand Oaks, California. At the University of California at Los Angeles, on leave from Rockwell, she studies drug addicts to find out individual patterns of return to the use of narcotics after treatment programs. At the Sloan Kettering Cancer Center in New York, Nancy Geller is evaluating factors associated with cancer recurrence. In addition, she helps with the data analysis in other studies. One of these studies involves identifying children with learning disabilities.

Ardyce J. Asire

The Challenge of Statistics

Fran McNamee is a statistician who believes that the best way to solve a problem is to decide exactly what the problem is, right at the beginning.

"... I spend a lot of time with clients in the beginning trying to learn as much as possible about what they are trying to do, and why. I also do a lot of reading to uncover possible solutions.

Fran finds that her biggest problems involve bad data—information that is missing or unavailable, errors in gathering the information, and poor reporting on the survey.

"... These problems are too often out of your control. You try to plan for these possibilities, but you're not always successful. Then you try to do the best with what you've got."
(Fran McNamee, Senior Statistician, Pacific Telephone Company, San Francisco, CA)

Fran's concerns are echoed by Ardyce Asire.

"... Data depends on other people—the people who collect the information and those who process it when it comes in. It's important to shorten the time from when the information is received to when it is analyzed, published, and circulated. This means computerizing and standardizing more and more aspects of our work."
(Ardyce J. Asire, Health Statistician, National Institutes of Health, Bethesda, MD)

Statisticians find that it is very important to convince other people to use good statistical techniques. As an industrial statistician, Betty K. Stewart helps metallurgists and engineers design their experiments to get as much information as possible, and to get it as precisely and economically as possible. Sometimes she offers her advice to other areas of the corporation.

"... I try to locate new areas within the laboratory and the plants where statistics can be helpful. Then, I have to convince non-statistical personnel to try these techniques."
(Betty K. Stewart, Senior Research Engineer, U.S. Steel Research Laboratory, Monroeville, PA)

Ginger Caldwell, a statistician with the National Bureau of Statistics, feels that studies designed with the help of a statistician often save the experimenter time and money. She assists scientists and engineers in evaluating the accuracy and precision with which they can make measurements.

"... One of my most important tasks is to encourage our scientists to consult with a statistician before an experiment is begun so that it can be designed to yield the needed information while minimizing the number of measurements which must be taken."
(Ginger Caldwell, Mathematical Statistician, National Bureau of Standards, Boulder, CO)

Statisticial Possibilities

Statisticians are needed wherever people are working with a lot of information. Actuaries in insurance firms are statisticians. So are the people who design public opinion polls, anticipate election results, advise companies about marketing trends, and decide whether the results of experiments would have happened that way by chance.

You can combine an interest in statistics with business, science, or teaching. If you are interested in measuring the accuracy of projections, studies, and experiments, statistics will provide the tools.

In the next few years, you will be finding out which classes interest you the most. You can talk to your teachers about the use of statistics in these fields. In college, you can combine the study of statistics with the area of your specialty, or you can study statistics itself. With this background, you can learn how to measure the probable outcomes of uncertain events.

Conclusion

More women than ever before are working outside the home, and they're continuing to work when they marry and have children. The Bureau of Labor Statistics, which keeps track of the number of people in the work force, provided the following information for 1979:

- Fifty-one percent of all women over 16 were in the labor force (compared to 78 percent of all men).
- Three-fourths of all working women work full-time.
- Almost half (48 percent) of all wives work.
- More than half (55 percent) of the wives whose husbands worked were also working.
- Forty-four percent of women with children under six worked outside the home.

These percentages are greater than they were 10 years ago, and 10 years from now they will probably be even greater.

When you complete your education, you will most likely go to work. In 1970, the average woman could expect to spend 23 years in the work force. Doesn't it make sense to get a good preparation so you can work in a career you'll enjoy?

Here are some things you can do to find out more about careers.

- Talk to people you know to find out about their work experiences.
- Try to find out what people do in the industries in your community.
- Look in the library for books about careers.
- Ask your teachers and counselors for suggestions.
- Write to the resource people listed in the back of this book.

You probably are not ready to decide on your career yet. Keep your eyes and your options open. The most important things you can do are to talk to people about their careers, read about various career possibilities, and think about which of these might be best for you and how you can prepare for them.

Bonnie C. Luneberg

Jane Day

Barbara L. Osofsky

Resource List

Here are the names and addresses of the women who answered our questionnaires. They can help you think about and perhaps plan a career in a math-related field. If some of them live near you, you may be able to visit and watch them at work. Women who are farther away will answer your letters. They may be able to advise you about courses to take and colleges to consider. They may be able to suggest summer jobs, other people to call, or special programs. This book is just the beginning. Good luck!

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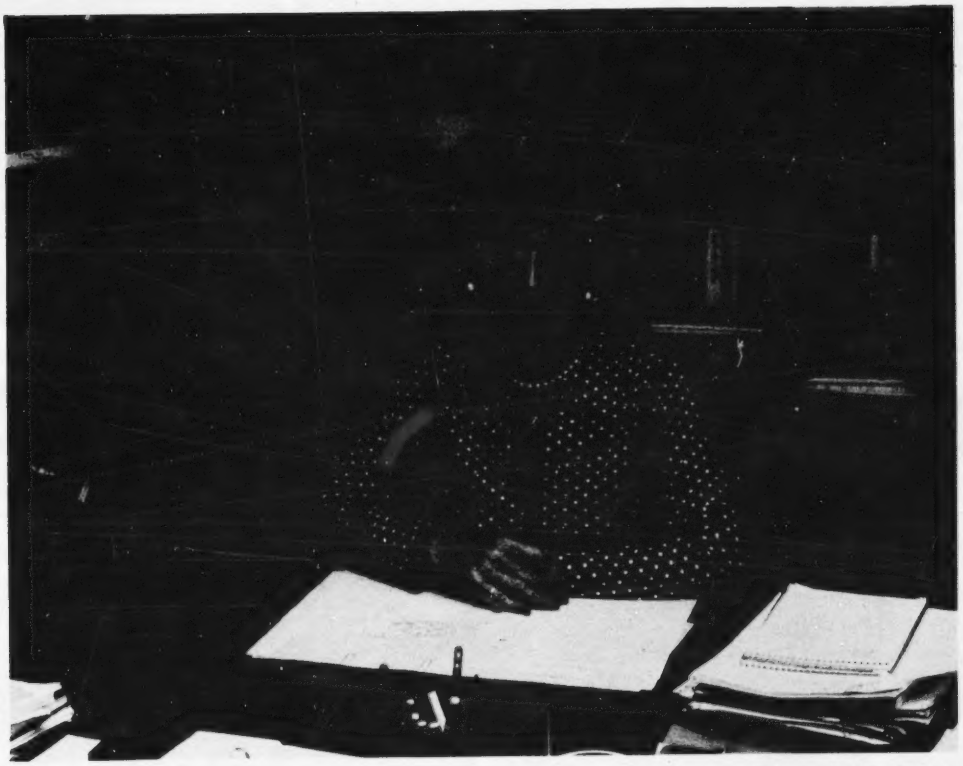

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If you write to them, these organizations will send you information about specific math-related careers.

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"... I realized that computer science was an up-and-coming field and decided to try it, even though I knew nothing about it. I enjoyed the logical thinking required and began to study computer science. Since then, my interest in various technical fields has increased."
(Adrienne Bahlke, Computer Science Student, Stanford University, Stanford, CA)

"... I like to see how things work. At first, I thought engineering was just numbers and machines. I thought that sounded dull. Now that I'm studying engineering, I see how many choices I have."
(Deborah Sweeley, Engineering Student, University of California, Berkeley, CA)

"... Since my interest in mathematics has always been strong, and since I had a younger brother who was an engineer, I decided to study engineering in night school. Semester after semester I gained more confidence. I finally decided that engineering was the right field for me and I went on to get a degree."
(Emma C. Barth, Professional Engineer, retired, Pittsburgh, PA)

"... I've taught everything from arithmetic with whole numbers up to pre-calculus. Besides keeping up with the field, teaching means being available to students in times of difficulty or personal crisis."
(June J.M. Yamashita, Kailua High School, Kailua, HI)

"... Sometimes I really get into my research and then it is a day and night and weekend and wake-up-in-the-middle-of-the-night sort of thing. The mix of creativity and precision in mathematics is matched in very few other disciplines."
(Judy Roitman, Associate Professor of Mathematics, University of Kansas, Lawrence, KS)

"... Working with numbers and basic accounting principles can be a challenge in any business; in a college or university it is critical to the health and well-being of the institution."
(Judith A. Arrigo, Director of Finance, Mills College, Oakland, CA)

"... We find out the amount of illness, its effects, and the medical care people receive. We collect the official 'vital statistics' of the United States. We try to anticipate the information that will be needed in the future and to start gathering that data ahead of time."
(Dorothy P. Rice, Director, National Center for Health Statistics, Hyattsville, MD)